



# Water Softeners, Septic Systems & Ground Water

## A FACT SHEET

If you live in an area with hard water you may use, or are considering using, a water softener in your home. Before you make that decision, the environmental and health effects should be considered when deciding whether or not to switch from hard water to soft water.

If you use a water softener, make sure your drinking water faucets are not connected to the water softener system. Because of the high sodium concentration in softened water, it should never be used for drinking or cooking. People on low sodium diets should avoid consuming softened water. Soft water is good for showering and laundry purposes because less soap or detergent is required in cleaning. But once that soft water goes down the drain, most people don't think about what effect it may have on their septic system and ground water.

### What Makes Water Hard?

Water containing high concentrations of magnesium and calcium, is described as "hard". While hard water is not a health risk, it can be a nuisance to homeowners because of mineral build-up (called calcite) on water fixtures and poor soap and detergent performance. Water softeners can be used to treat hard water.

### What do Hardness Numbers Mean?

You've had your water tested and the lab report shows the hardness level of your water is 50 ppm. What does that mean? Because hardness is a property that is attributed to several factors, a common method has been developed for expressing concentrations in quantitative terms. This table illustrates the relationship between the calculated value and the "hardness classification".

#### Water Hardness Classification

Classification	mg/l or ppm	grains/gal
Soft	0 – 17.1	0 – 1
Slightly hard	17.1 – 60	1 – 3.5
Moderate hard	60 – 120	3.5 – 7.0
Hard	120 – 180	7.0 – 10.5
Very hard	180 & over	10.5 & over

*Call the Gallatin Local Water Quality District for a listing of laboratories that test water hardness.*

### How Do Water Softeners Work?

Water softeners are used to continuously remove calcium and magnesium from the water via an exchange process. Through this process the hard water passes through a resin media bed saturated with sodium. As hard water passes through the system, calcium and magnesium atoms attach to the resin in the media bed and sodium atoms are released from the resin bed into the water, making the water soft.

Eventually, the resin becomes saturated with magnesium and calcium and runs out of sodium. To allow the system to operate continuously, the resin bed must be flushed and recharged. This is done by passing a sodium-rich solution (large amounts of salt dissolved in water) through the resin. This sodium-rich water is flushed through the softener. Sodium atoms in the solution replace the magnesium and calcium atoms on the resin. The resin bed is once again saturated with sodium and the whole process can begin again. The wastewater produced during this flushing (backwash) process contains high concentrations of calcium, magnesium, sodium and chloride. If you use a septic system, this "salty" wastewater is discharged to your septic tank.



## Are Water Softeners Bad for Septic Systems?

Bacteria are an essential component of the septic system. These organisms partially digest the organic matter that enters the septic tank and the solids "settle" in the septic tank, to be pumped out at a later time. Relatively clear water (effluent) is discharged from the septic tank to the soil through a distribution system commonly, a drain field or leach field. If you are using a water softener the sodium, calcium, magnesium, and chloride-rich wastewater produced during the recharge process is discharged to your septic tank. These contaminants are not treated by the bacteria in the septic tank, and pass through to the drain field. There is debate as to whether or not this "salty" wastewater is harmful to septic systems. Here are two viewpoints on this subject:

**View 1:** Studies have been conducted which provide good news to the homeowner who uses a water softener or is considering installing one.

The University of Wisconsin-Madison (UW-M) and the National Sanitation Foundation (NSF) each conducted research to address the following questions:

1. Is the salt discharged from a water softener toxic to the bacteria in a septic system?
2. Does the liquid flow rate produced during the water softener's regeneration cycle upset the septic tank digestion process and cause untreated sewage solids to enter into the drain field?
3. Will the sodium in the septic effluent cause some soils to "swell" and reduce the water percolation rate through the soil?

The studies indicated that increased sodium in the softened water was actually helpful to the bacteria in the septic tank by stimulating biological action in the tank, and did not hurt the soil's ability to absorb water in a normal drain field. The volume of softener backwash during regeneration was easily within the limits of what the septic tank could handle. In fact, an automatic washer would pose a greater threat to the septic tank than a water softener. And, finally, the salt-rich effluent thought to possibly interfere with soil permeability in the drain field might actually improve soil percolation, particularly in fine textured soils such as clay.

**View 2:** Several studies and "schools of thought" indicate that homeowners should make every effort to minimize the input of salts to their septic systems. This includes, in addition to water softeners, certain cleaning solutions and household chemicals, which contain high levels of sodium

(drain opener, certain laundry detergents). A lack of or excessive amounts of salt will kill the beneficial bacteria in the septic tank. Therefore, excess salt concentrations in septic tank effluent can have a detrimental effect on the sewage treatment capabilities of the septic system. Because the bacteria are reduced, untreated sewage is released into the drain field reducing the effectiveness of the system and increasing the need to have the septic tank pumped. The regular addition of salt will have this effect continuously over the life of the septic system.

In addition, some experts believe that water containing high concentrations of sodium is potentially harmful to the water absorption characteristics of soil. That is, high sodium loading of septic tank effluent to a drain field will eventually make the soils impermeable (non-absorbing) after prolonged use. This is an important problem where the soils are composed of clay minerals that shrink and swell when dry and wet, respectively. A general and preliminary assessment of where these clays are present in the GLWQD can be found at:

<http://mapserver.giac.montana.edu/maps/319a/shrink.html>

A report from the Department of Soil Science, North Carolina University, suggests more studies need to be conducted to assess the impact water softeners have on the performance of septic systems in different soil types. This includes the possibility of using potassium chloride instead of sodium chloride in water softening systems and determining what impact it has on soil water absorption properties.

Another observation suggests that the increased salt load from the water softener to the septic tank may increase the density of effluent in the



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tank enough to retard settling of solids. This could result in solids eventually being transported into

the drainfield and inhibiting the efficacy of the drainfield.

## Do Water Softening Systems Impact Ground Water?

**Yes.** Since the sodium, calcium, magnesium, and chloride contained in the "salty" discharge water from the water softener is not treated in the septic tank and passes through to the drain field; there is an impact to ground-water quality.

In general the soils in the drain field area can trap the calcium and magnesium in much the same way as the resin bed in the water softener system does. However, sodium is much more soluble in water and does not readily attach to the soils. The chloride does not attach to the soils in the drain field area. Most of the sodium and chloride discharged to the drain field moves with the treated wastewater downward to the water table.

**For the most part, all of the salt that you buy to make your water softener work ultimately ends up in the ground-water system.**

So, regardless of whether or not sodium has a positive or negative impact on the functioning processes of a septic system, **the effects of excess salt on ground water are detrimental.**

Although sodium from an individual septic system may make an insignificant contribution to ground water contamination, the sheer number of such systems and their widespread use in densely developed areas without a public sewage treatment system makes them a serious potential ground-water contamination source.

Locally, a septic system hooked to a water softening system may have a significant impact to ground water, and it may impact your own well.

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